

REMARKS

Applicant requests favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 2-5, 12-15, 19-24 and 29-53 are presented for consideration. Claims 2, 12, 22, 29, 34, 36, 38, 40, 42-46, 48, 50 and 52 are independent. Claims 6 and 16 have been canceled without prejudice or disclaimer. Claims 2, 12, 22, 29, 34, 36, 38 and 40 have been amended to clarify features of the subject invention, while claims 42-53 have been added to recite additional features of the invention. Support for these changes and claims can be found in the original application, as filed. Therefore, no new matter has been added.

Applicant requests favorable reconsideration and withdrawal of the objections and rejections set forth in the above-noted Office Action.

Applicant notes with appreciation that claims 6 and 16 would be allowable if rewritten in independent form to include the recitations of their respective base claims. To expedite prosecution, Applicant has amended independent claim 2 to substantively incorporate the features of claim 6, and has amended independent claim 12 to substantively incorporate the features of claim 16. Claims 6 and 16 have been canceled without prejudice or disclaimer. Applicant submits, therefore, that independent claims 2 and 12, as well as claims 3-5, 13-15, 19-21, 30 and 31, variously depending therefrom, should be deemed allowable at the outset. In addition to these claims being allowable, Applicant submits that independent claims 22, 29, 34, 36, 38 and 40, likewise should be deemed allowable. In this regard, again to expedite prosecution, Applicant has amended these claims along the lines discussed above with respect to

independent claims 2 and 12. Accordingly, independent claims 22, 29, 34, 36, 38 and 40, as well as claims 23, 24, 32, 33, 35, 37, 39 and 41, variously depending therefrom, likewise should be deemed allowable at the outset. In addition to these claims being allowable, Applicant further submits that new claims 42-53 likewise should be deemed allowable.

Claim 36 was objected to on formal grounds. The Examiner noted that certain words were left out of claim 36 at line 7. This phraseology in claim 36 has been otherwise amended. Applicant submits, therefore, that this objection has become moot and should be withdrawn.

Turning now to the art rejections, claims 2-5, 12-15, 20, 21, 30, 31 and 34-41 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,719,704 to Shiraishi. Claims 19, 22-24, 29, 32 and 33 were rejected under 35 U.S.C. § 103 as being unpatentable over the Shiraishi patent in view of U.S. Patent No. 5,218,660 to Omata. Applicant submits that the cited art, whether taken individually or in combination, does not teach or suggest many features of the present invention as previously recited in these claims. Therefore, these rejections are respectfully traversed. Nevertheless, as discussed above, Applicant has amended independent claims 2, 12, 22, 29, 34, 36, 38 and 40 to place those claims in allowable form.

Applicant further submits that the cited art, whether taken individually or in combination does not teach or suggest the salient features of Applicant's present invention, as recited in new claims 42-53.

In one aspect of the invention, independent claims 42 and 44 recite illumination optical systems having a total reflection type light transmitting element for illuminating a surface to be illuminated. In one aspect of the invention, as recited in independent claim 42, the illumination

optical system includes an illumination optical system for forming an image of a light source upon a predetermined plane by use of light from the light source. In another aspect of the present invention, as recited in independent claim 44, a plurality of light sources are provided for illuminating a predetermined plane. The illumination optical systems recited in independent claims 42 and 44 also include a converting optical system that includes an optical rod and a lens unit. A light entrance surface of the optical rod is disposed substantially in coincidence with the predetermined plane, while a light exit surface of the optical rod is disposed substantially in coincidence with a front focal plane of the lens unit, and a rear focal plane of the lens unit is disposed substantially in coincidence with a light entrance surface of the light transmitting element.

Independent claims 46 and 50 recite various aspects of exposure apparatus. The exposure apparatus recited in independent claim 46 recites an illumination optical system having features such as those discussed above with respect to independent claim 42, and a projection optical system for projecting a pattern of a mask onto a wafer. The exposure apparatus recited in independent claim 50 includes an illumination optical system having features such as those discussed above with respect to independent claim 44, and a projection optical system for projecting a pattern of a mask onto a wafer.

In other aspects of the invention, independent claims 43 and 45 recite illumination optical system for illuminating a surface to be illumination, with light from a light source and by use of an optical fiber bundle. The illumination optical system recited in independent claim 43 includes an imaging optical system for forming an image of a light source upon a predetermined plane, by

use of light from the light source. The illumination optical system of the present invention recited in independent claim 45 includes a plurality of light sources for illuminating a predetermined plane. The illumination optical systems recited in these claims also include a converting optical system that includes an optical rod and a lens unit. A light entrance surface of the optical rod is disposed substantially in coincidence with the predetermined plane, while a light exit surface of the optical rod is disposed substantially in coincidence with a front focal plane of the lens unit, and a rear focal plane of the lens unit is disposed substantially in coincidence with a light entrance of the optical fiber bundle.

Independent claims 48 and 52 recite various aspects of exposure apparatus. The exposure apparatus recited in independent claim 48 includes an illumination optical system that includes features such as those discussed above with respect to independent claim 43, and a projection optical system for projecting a pattern of a mask onto a wafer. The exposure apparatus of the present invention recited in independent claim 52 includes an illumination optical system that includes features such as those discussed with respect to independent claim 45, and a project optical system for projecting a pattern of a mask onto a wafer.

Applicant submits that the cited art does not teach or suggest such features of the present invention, as recited in independent claims 42-46, 48, 50 and 52.

The Examiner relies on the Shiraishi patent for teaching an illumination optical system that includes an imaging optical system for forming an image of a light source at a predetermined plane and a converting optical system for directing light from the light source image to a total reflection type light transmitting element or an optical fiber bundle.

The Examiner relies on the Omata patent for teaching an optical fiber bundle with a light entrance surface of a rectangular shape and a light exit face of an arcuate shape for transforming light from a lens to be emitted with an arcuate cross-sectional shape.

Applicant submits, however, that neither the Shiraishi patent nor the Omata patent teaches or suggests at least the salient features of the converting optical system of the present invention recited in independent claims 42-46, 48 and 52, which have been discussed above. Accordingly, those patents, whether taken individually or in combination, should not be read to render obvious Applicant's present invention recited in those claims.

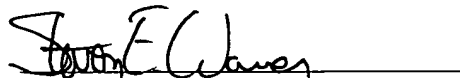
For the foregoing reasons, Applicant submits that the present invention, as recited in independent claims 42-46, 48, 50 and 52, also is patentably defined over the cited art.

Dependent claims 47, 49, 51 and 53 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicant further submits that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the objections and rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,


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